TRANSACTIONS
OF THE SAN DIEGO
SOCIETY OF
NATURAL HISTORY

Volume 19 Number 12 pp. 169–179 10 April 1980

Four species of *Pterynotus* and *Favartia* (Mollusca: Gastropoda: Muricidae) from the Philippine Islands

Anthony D'Attilio and Hans Bertsch

Abstract. Four species of muricid gastropods from the Philippine Islands are discussed and figured. Three of the species are described as new.

Introduction

During the past several years collectors and fishermen in the Philippines have obtained many new or otherwise interesting specimens of marine mollusks. Some of this valuable material has been given by collectors and dealers to museums in this country for study and identification, resulting in the publication of several new taxa (*see* Emerson & D'Attilio, 1979).

Through the courtesy of several shell dealers cited below, we have recently obtained for the collection of the San Diego Natural History Museum specimens of 4 species of muricid gastropods. These were obtained mostly by native Philippine fishermen using tangle nets laid out overnight in depths of 150 metres and less. One of these species was recently described by Dr. Kosuge in a new Japanese journal devoted to malacology; the other 3 are new species we describe herein.

Muricidae Rafinesque, 1815
Muricinae Rafinesque, 1815
Pterynotus Swainson, 1833

Type species *Murex pinnatus* Swainson, 1822 (=*Purpura alata* Röding, 1798) by subsequent designation, Swainson, 1833 (text to plate 122).

The genus *Pterynotus* encompasses Muricinae shells having 3 or more varical flanges or flanges developing into spines. Several subgenera have been proposed for this genus, especially by Jousseaume, 1880. These subgeneric taxa have been variously accepted or rejected or at times raised to full generic rank. The present species are referable to *Pterynotus* sensu stricto based on their alate trivaricate morphology and dentate labrum (as in the generic type species). A variable characteristic of the genus is the presence or absence of denticles on the columella. The new species described here as *Pterynotus aparrii* has columellar denticles, whereas *Pterynotus miyokoae* lacks denticles.

Pterynotus miyokoae Kosuge, 1979
(Figures 1a, b, c, d)

Original reference.—*Pterynotus miyokoae* Kosuge, 1979, pp. 1–2, plt. 1, figs. 1–7.

Supplementary description.—The shell of the largest specimen we examined is 67 mm high, broadly fusiform, protoconch of 1½ polished rounded whorls; spire of moderate height, strongly convex and possessing 7 whorls; suture deeply impressed. The

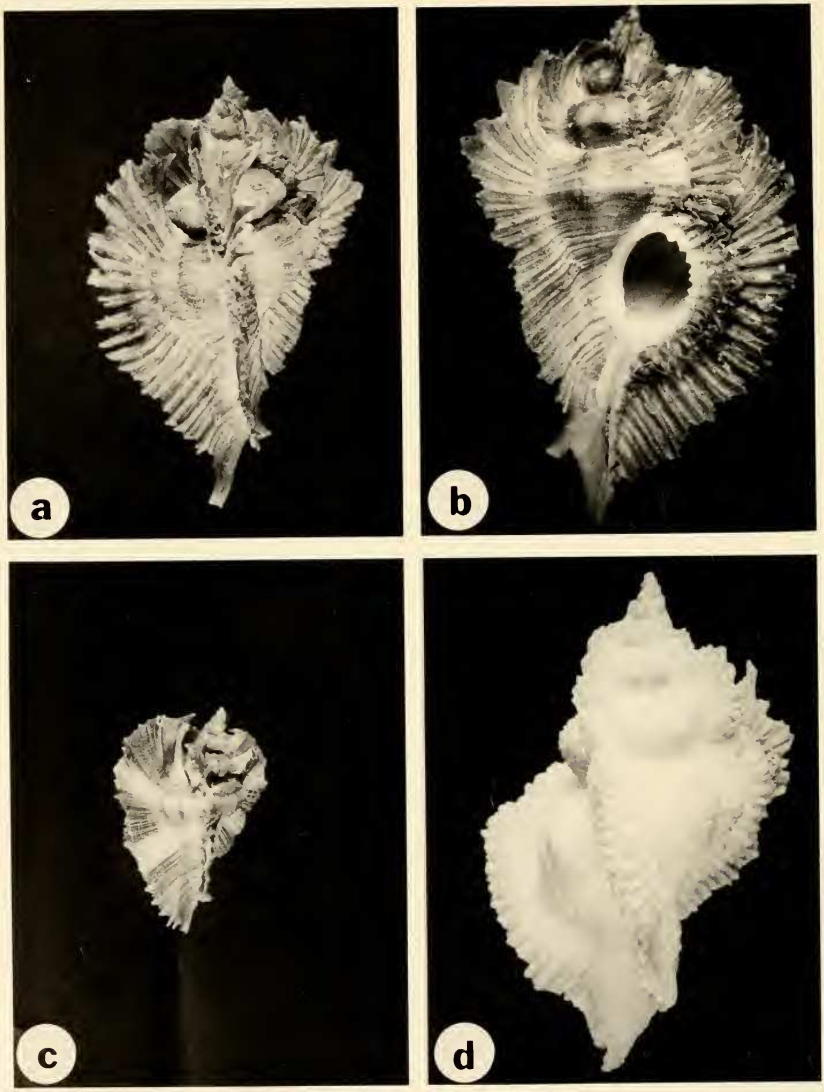

FIG. 1. *Pterynotus miyokoae* Kosuge, 1979. a. Dorsal view of shell, 67-mm-long specimen; Clifford and Clifton Martin Collection. b. Apertural view of shell of specimen illustrated in Fig. 1a. c. Dorsal view, 36-mm-long specimen; Ben and Ruth Purdy Collection. d. Dorsal view, 65-mm-long specimen, collected at Russell Island in the Solomons; AMNH 196014.

body is of moderate size relative to spire; canal moderately long, terminally attenuated, and recurved with a sinuous narrow opening. Aperture is broadly ovate, the anal sulcus is bracketed by a denticle on either side; immediately below the small denticle at the sulcus the entire outer crenulate lip has a continuous series of strong elongate denticles

arranged singly posteriorly and in pairs anteriorly; closer to the apertural margin the major denticles have smaller swellings on either side which may become terminally bifurcate; the arcuate columella is simple.

Axial sculpture consists of 3 broad, wing-like varices which expand continuously from the lower portion of the canal to their termination at the suture. In addition the elongated varical wing is decidely recurved over the shoulder. The varices are aligned slightly oblique to the axis, and the flanges overlap on the spire with each new flange on the receding side of the earlier one; the margins of the varices terminate in short fine, spiny extensions varying slightly in length according to the strength of the spiral cords, but increasing in length so that the longest spine is near the preceding whorl. On the final and central varix there is a strong axial swelling which is the result of a strong depression between the varix and body and another lengthy depression on the forward side of the varical flange.

Two nearly equally-sized knobby costae are found intervarically on the shoulder and fading before the base of body whorl. Spiral sculpture consists of numerous primary cords (about 26) extending from the suture to the lower portion of the canal; the interspaces between the primary cords contain secondary or lesser cords; all spiral sculpture is scabrously ornamented except that when the scales are abraded the thickened bases of the scales remain in the form of knobs. The fluted leading (ventral) sides of the varical wings are scabrously laminate heavily below, lightly above where the surface displays strong fluting.

The shell is a medium shade of rust or rust brown; with one slightly paler band at the shoulder, one at the base of the body, and a much weaker one is perceptible on the canal. In light-colored specimens the shell appears white with pale brown bands. There is a narrow whitish band at the suture, the aperture is off white. Some specimens differ in the intensity of the brown color which is chocolate brown in one specimen.

The operculum is typically unguiculate muricine with the nucleus at the base and concentric ridges radiating from the nucleus.

Type locality.—Off Mactan Island, Cebu, Philippines, in 200 m.

Material examined.—1) One shell, 67 mm long; collected in the Philippine Islands, March 1979, from fishermen's nets, depth unknown; in the collection of Clifford and Clifton Martin.

2) Two specimens, 62 mm and 36 mm; dredged at Vaval, in the Philippine Islands, depth unknown. These specimens are in the collection of Ben and Ruth Purdy.

3) Two shells, 65 mm (AMNH collection 196014) and 53 mm (Robert and Dorothy Janowsky collection) long; collected at Russell Island in the Solomons (slightly southeast of 9° S; 159° E), January 1977, dredged from 600 feet (off a fine sand bottom with coral rubble). These specimens constitute a southeastward range extension for *Pterynotus miyokoae* of ≈4000 km from the Philippines.

Discussion.—As suggested by Kosuge, this species is most closely related to *Pterynotus loebbeckei* (Kobelt in Löbbecke and Kobelt, 1879), a species previously known from the area of Cebu and Bohol Islands in the Philippines as well as from the type locality in southeastern Japan. Through the courtesy of R. and D. Janowsky, we have examined specimens of *P. loebbeckei* (which establish a westward range extenstion of more than 8000 km) collected at Reunion Island in the Indian Ocean.

Pterynotus loebbeckei lacks the strongly sculptured characters of *P. miyokoae*, in that the axial costae are weak and form no prominent feature of the shell; the heavy ridge forms a conspicuous feature of the varical base in *P. miyokoae* but is lacking in *P. loebbeckei*; the varical margin is only weakly recurved; the strongly recurved portion of the varical flange over the shoulder on *P. miyokoae* but wanting in *P. loebbeckei*, being reduced in a descending manner towards the previous whorl. The columella of *P. miyokoae* in the 5 examples we examined is smooth and does not possess the characteristic strong denticles on the upper and lower portion which occur in *P. loebbeckei*; the outer (labrum) apertural denticles in *P. loebbeckei* are of simple form showing no other sculptural elaboration as in the new species. In contrast to the banded brown over whitish coloration of the new species, *P. loebbeckei* has an apricot orange

or orange pink coloration within the outer portions of the aperture, and on the columella callous as well as over the remaining shell.

Pterynotus ***aparrii*** D'Attilio & Bertsch, sp. nov.
(Figures 2a, b, c, d)

Description.—Shell reaches approximately 35 mm high; narrowly fusiform, protoconch not preserved; spire relatively low of fine moderately convex whorls; suture weakly impressed; body whorl weakly convex and moderate in size; canal long, terminally tube-like and strongly recurved and narrowly open. Aperture is of a tear-drop shape, pointed anteriorly; anal sulcus u-shaped with a large knobby denticle on the outer side; the outer lip is wavy with crenulations reflecting the spiral sculpture and there are 5 short elongate denticles within the lower portion of the apertural margin; between these denticles and the large posterior one delimiting the anal sulcus there is a gap which has only one small denticle; the inner lip is adherent above, erect below and possesses 3 denticles on the lower half of the columella. The canal possesses the extension of a varical flange on its right side; a prominent recurved canal from a previous whorl is on its left side.

Axial sculpture consists of 3 blade-like varices which cross the shoulder strongly, diagonal to axis; the last and intermediate blade only is well developed; the varical blades are undulating and the margins have large lobe-like extensions at the shoulder, a secondary one at the base of body whorl and a lesser one on the canal; a single weak costa is found intervarically.

The spiral sculpture consists of numerous cords of minor or major character with the stronger cords extending the varical blade into a spiny-edged lobe; there are 3 major cords at the shoulder lobe, 2 to 3 major cords at the base of the body whorl and 2 on the canal; finer cords occur between the major cords to form a continuous varical blade from above the recurved portion of the canal to a termination of the blade against the preceding whorl; the entire surface of the intervarical area and the dorsal side of the varical blades are crossed by close set raised growth striae which are in addition scabrous when not abraded. The leading side of the varical blades are scabrously laminate below on the thickened varix, and less so on the fluted area of the blades as they project above the thickened varix.

Color of shell is pale orange; aperture is a deeper orange especially rich in the area of the denticles.

Operculum not known.

Material examined.—1) Holotype, San Diego Natural History Museum, Department of Marine Invertebrates, Type Series: SDNHM T.S. 518. Shell is 35 mm long; collected at Punta Engaño, Cebu Island, in the Bohol Straits, Philippine Islands, 1978, from fishermen's nets in approximately 75–100 metres of water.

2) Two specimens, 32 mm and 27 mm long; collected at Punta Engaño, Cebu, 1978, fishermen's nets. These specimens are in the collection of Ben and Ruth Purdy.

3) One specimen, 37 mm long; collected at Panglao, Bohol, Philippine Islands. This shell has a golden yellow coloration, and is in the collection of Gene Everson.

Type locality.—Punta Engaño, Cebu Island, Bohol Straits, Philippine Islands (approximately 10° 20′ N; 124° E).

Etymology.—The patronym honors a knowledgeable shell fisherman, Mr. Rudolpho O. Aparri of Cebu City, Philippine Islands (the -ii suffix results from adding the genitive singular case-ending to the entire surname).

Discussion.—This new species has a smaller shell than *Pterynotus loebbeckei* which it resembles superficially because of its color. It also resembles both in color and in size *Pterynotus bibbeyi* (Radwin and D'Attilio, 1976), known mostly from southeastern Japan.

The new species differs in having 3 varices, whereas in *P. bibbeyi* all specimens examined have 4 varices. *Pterynotus aparrii* also resembles *Pterynotus laqueatus* (Sowerby, 1841) which has a similar size and somewhat similar coloration. However,

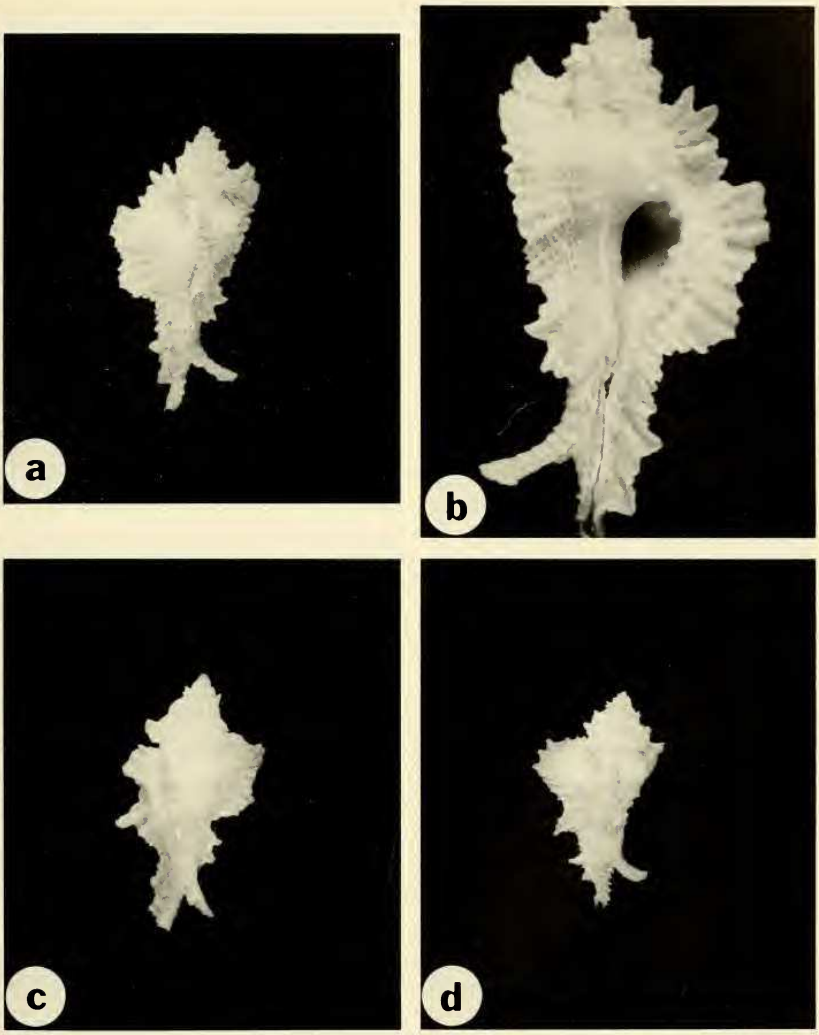

FIG. 2. *Pterynotus* ***aparrii*** D'Attilio & Bertsch, sp. nov. a. Dorsal view, holotype specimen, SDNHM T.S. 518 (shell is 35 mm long). b. Apertural view, holotype specimen, SDNHM T.S. 518. c. Dorsal view, 32-mm-long specimen; Ben and Ruth Purdy Collection. d. Dorsal view, 27-mm-long specimen; Ben and Ruth Purdy Collection.

P. laqueatus has not yet been discovered elsewhere than at Guam in depths accessible to scuba diving, in about 25 to 30 metres. *Pterynotus laqueatus* differs by its regular subcircular aperture, proportionately higher spire, coarser spiral sculpture, a strong intervarical costa, an additional costa at base of receding side of the varix, and its color which is variably shaded pink, pink-violet and pale orange.

Muricidae Rafinesque, 1815
Muricopsinae Radwin & D'Attilio, 1971
Favartia Jousseaume, 1880

Type species, *Murex breviculus* Sowerby, 1834, by original designation. Recent workers have treated the species referable to *Favartia* and *Murexiella* Clench and Perez Farfante, 1945, at differing generic–subgeneric levels. Radwin and D'Attilio (1976:144–161) recognized these genus-group taxa as full genera. Ponder (1972) virtually synonymized the 2 taxa, giving only a token subgeneric status to *Murexiella,* because the "shell features are not consistently different in species ascribed to both groups."

It is true that the species of *Favartia/Murexiella* show a range of variation for a number of characteristics, which appears diverse and inconsistent. A clear example of the range of shell morphology can be seen by comparing sculpture, spine length, and varical flange development of various species of *Favartia*: *F. humilis* (Broderip, 1833), *F. macgintyi* (M. Smith, 1938), *F. salmonea* (Melvill and Standen, 1899), *F. confusa* (Brazier, 1877), *F. cellulosa* (Conrad, 1846), and *F. brevicula* (Sowerby, 1834).

We agree with Ponder that justification does not exist for both *Favartia* and *Murexiella* to be recognized at the generic rank. We afford *Murexiella* subgeneric recognition and restrict to this taxon, species that have the long spines connected by varical webbing that is characteristic of *Favartia* (*Murexiella*) *hidalgoi* (Crosse, 1869), the type species, including also: *F.* (*M.*) *bojadorensis* (Locard, 1897?), *F.* (*M.*) *radwini* (Emerson and D'Attilio, 1970), *F.* (*M.*) *diomedaea* (Dall, 1908), *F.* (*M.*) *mactanensis* (Emerson and D'Attilio, 1979), and *F.* (*M.*) *martini* (Shikama, 1977).

Regardless of the different generic interpretations, the 2 new species described here are referable to *Favartia* (sensu stricto).

Favartia ***pelepili*** D'Attilio & Bertsch, sp. nov.
(Figures 3a, b, c)

Description.—This species has a shell attaining over 30 mm in height; is biconically fusiform, an indeterminate protoconch, a high spire of 5 weakly shouldered whorls, suture weakly defined; body moderately broad; canal broad above, below tapering tubelike and terminally strongly recurved, very narrowly opened, and bearing 3 previous terminal portions of the canals on its left side; aperture ovate moderately small with the margin strongly erect; the outer lip undulated into 5 troughs or grooves extending within for a short distance; no appreciable anal sulcus discernible.

Axial sculpture consists of 5 varices raised above into spiny extensions; the varices are aligned moderately diagonal relative to the axis of the shell, and over the shoulder the notable varical margin arches very strongly to the following varix, in part obscuring the suture; very fine growth striae are found intervarically.

Spiral sculpture consists of 5 rounded cords, the uppermost one at the shoulder, the interspaces between the cords diminish progressively to the fifth cord at base of body. The cords develop into recurved spines above (at apex) the varix, the shoulder one is longest and less recurved than the following 3, the last spine (5th) is much less recurved and is pointed in the growing direction. The spine on the canal is forward projecting and otherwise similar to the lowest spine on the body. Terminally these spines spread out into 2 or 3 folded lobes. Spinelets are distributed one each between the spines on the body and the canal spine. Two or 3 overlapping spinelets constitute the ornamentation on the varix across the shoulder. The spines are weakly opened or fold inwardly to touch centrally. On their leading side a 2nd smaller set of similar spines is nested between the lower portion of the major spines; below these secondary spines there are yet smaller similar spines. Between the last spines and the varical margin there are a few weak scabrous lamellae. The structure of secondary spines forms in effect a low webbing between the spines.

The shell is a light umber brown and a paler lighter umber suffuses the aperture.

The holotype is 33 mm long. The paratype is smaller (18 mm in length) and is

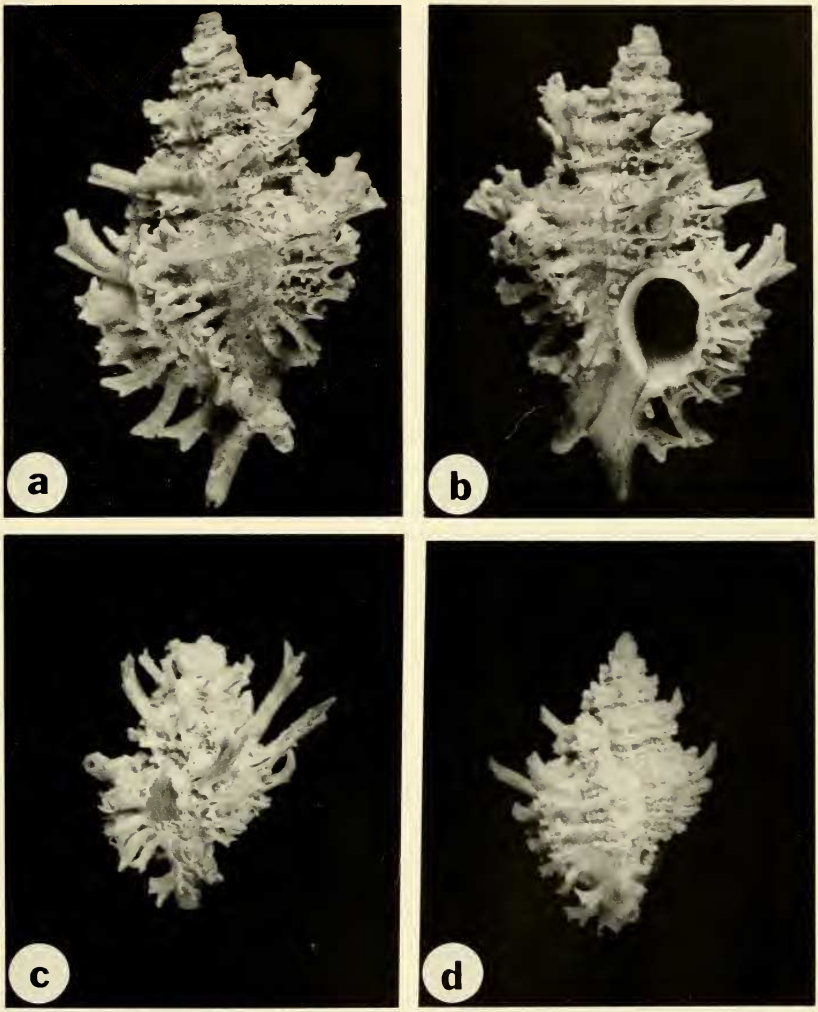

FIG. 3. *Favartia* ***pelepili*** D'Attilio & Bertsch, sp. nov. a. Dorsal view, holotype specimen, SDNHM T.S. 519 (shell is 31 mm long). b. Apertural view, holotype specimen, SDNHM T.S. 519. c. Dorsal view, paratype specimen, SDNHM T.S. 520 (shell is 18 mm long). *Favartia* ***judithae*** D'Attilio & Bertsch, sp. nov. d. Dorsal view, 20-mm-long shell; Judith Bertsch Collection.

distinguished from the holotype by the comparatively extreme length of the shoulder spines which are not bent and project diagonally upward as high as the spire. Color of paratype similar to holotype.

Material examined.—Two specimens; Holotype, SDNHM T.S. 519; shell is 33 mm long. Paratype, SDNHM T.S. 520; shell is 18 mm long. Both specimens collected in the Bohol Straits, between Bohol and Cebu Islands, Philippine Islands, early in 1979, by fishermen's nets in approximately 75 to 100 metres of water.

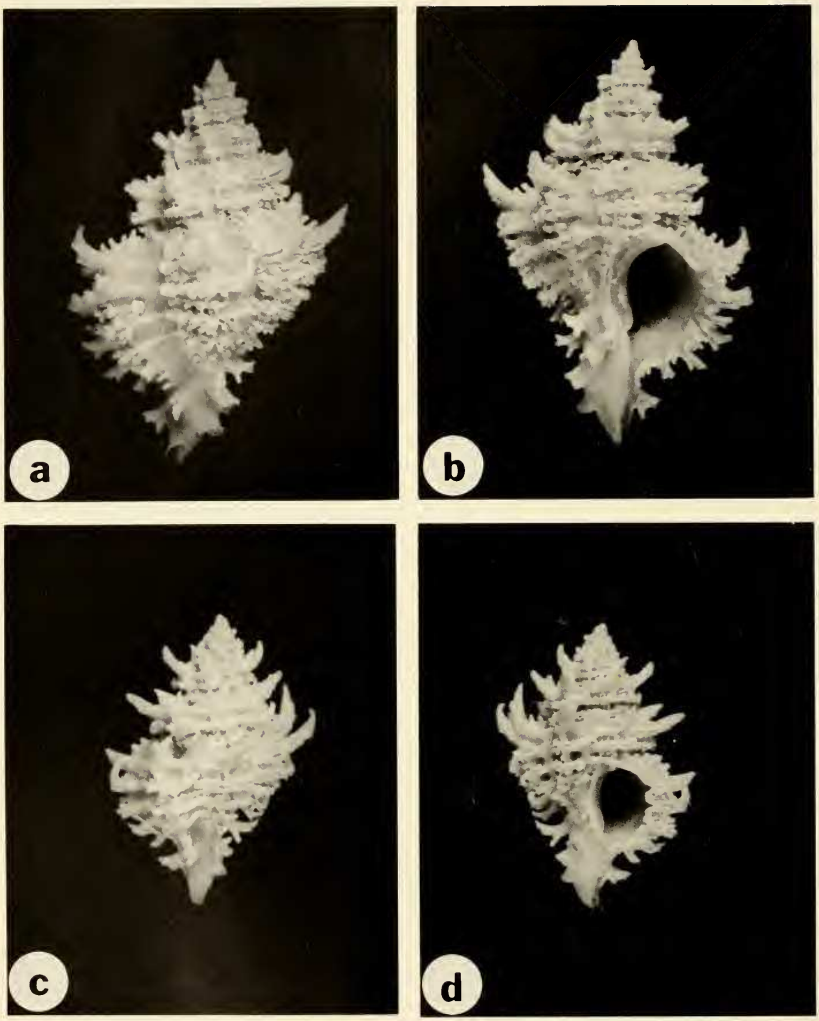

FIG. 4. *Favartia judithae* D'Attilio & Bertsch, sp. nov. a. Dorsal view, holotype specimen, SDNHM T.S. 521 (shell is 25 mm long). b. Apertural view, holotype specimen, SDNHM T.S. 521. c. Dorsal view, paratype specimen, SDNHM T.S. 522 (shell is 19 mm long). d. Apertural view, paratype specimen, SDNHM T.S. 522.

Type locality.—Bohol Straits, Philippine Islands (approximately 10° 20′ N; 124° E).

Etymology.—The species name means Pele's hair (a combination of Pele—Hawaiian volcano goddess, and *pili*—Latin plural, hairs; used as a noun in apposition; the genitive ending has been omitted from Pele for the sake of euphony), a term in vulcanology that indicates volcanic glass spun out into hairlike form. The shell with its long spines resembles a small piece of lava with wind-blown "hair" streaming behind.

Discussion.—This species differs from other Indo-Pacific species of *Favartia* by its larger size and longer spines on the varices. *Favartia salmonea* (Melvill and Standen, 1899) represents the opposite end of this type of shell development with varices having poorly developed scale-like spines; it also has a richly variable coloration from pink to orange or red. An intermediately related form is *Favartia balteata* (Sowerby, 1841), easily recognized by its flesh colored shell, rosy aperture, and short, burnt-brown, foliose scaley spines. Two other related species are *Favartia voorwindei* Ponder, 1972 and *Favartia striasquamosa* Ponder, 1972, which differ in having uncolored smaller shells of ≈10 mm and relatively lower spined varices numbering 6 to 7.

Favartia ***judithae*** D'Attilio & Bertsch, sp. nov.
(Figures 3d, and 4a, b, c, d)

Description.—This species reaches a length of ≈25 mm. The shell is broadly biconically fusiform, the protoconch (Fig. 4c–d) has 2½ rounded whorls, the spire is moderately high and consists of 5 convex whorls; the suture is weakly defined; the body whorl is broad and convex; the ovate aperture is moderate in size; the margin of the inner lip is adherent above and weakly erect below, the outer lip has an undulate margin that is a reflection of the external spiral sculpture; no anal sulcus discernible; the barely open canal is broad above with the tube-like recurving distal portion bent at a right angle, this character is best seen when this portion of the canal is preserved; in the holotype the canal ends shortly after starting to recurve. The terminal portions of 4 former canals are preserved on the siphonal fasciole.

Axial sculpture consists of 7 varices, the varices are broad with relatively narrow intervarical spaces; the varices are continuous over the shoulder from whorl to whorl and aligned diagonally to axis of the shell; the varical margins arch to the preceding whorl thereby obscuring the suture.

Spiral sculpture consists of 5 rounded cords situated from shoulder to base of body and progressively diminishing in strength in that direction; transverse striae are very fine. After crossing the intervarical spaces the cords terminate as spines above the crest of the varix. The shoulder spine is strongest but weakly recurved relative to the 2nd and 3rd which are more strongly recurved and in addition are twisted posteriorly; the 4th and 5th spines diminish in size and degree of recurving. All spines are open with their forward directed margins strongly undulate. Three progressively shorter similar spines are nestled below and within each main spine; the remaining varical area between the spines and the margin is ornamented with a few rows of scaly laminae. There is a strong spine on the canal preceding its recurved distal portion, additional single spinelets occur between the major spines, and 3 or 4 spinelets are situated between the spine on the canal and that on the body whorl. The varix above the shoulder has 4 or 5 marginally scabrous spinelets.

Shell color is a relatively rich flesh pink; the aperture ranges from a deeper pink to light red.

Material examined.—Three specimens. Holotype, SDNHM T.S. 521; shell is 25 mm in length. Paratype, SDNHM T.S. 522; shell is 19 mm in length. One specimen, shell length 20 mm, in the collection of Judith Bertsch. All 3 specimens were collected by tangle nets (in about 75 to 100 metres depth) off the north end of Mactan Island, Bohol Straits, Philippine Islands.

Type locality.—Bohol Straits, between Cebu and Bohol Islands, Philippine Islands (approximately 10° 20′ N; 124° E).

Etymology.—This species is named for Judith Bertsch, wife, fellow diver, and field assistant.

Discussion.—This species has a compact shell, richly scabrous in sculpture, and of similar morphology to *Favartia pelepili*. It differs from that species in the number of varices (7 as against 5 for *F. pelepili*), its smaller size and the reddish coloration in place of light brown. In contrast to the present taxon, most species of *Favartia* have smaller shells (except *F. breviculus*) and are commonly colored some shade of white

or grey white. It is distinguishable from other Indo-Pacific species for the same reasons specified in the discussion of *F. pelepili*.

In both *Favartia pelepili* and *F. judithae*, the leading (adapertural or growing) side of the spines is exceedingly complex and bristly, bearing many smaller spines jammed up against each other. The receding (abapertural) edge, by comparison, is almost smooth. This extreme development of spines upon spines, and the great length of the major spines that recurve almost to 180°, are more characteristic of these two new species than other *Favartia* species in which these traits are less pronounced.

Acknowledgments

We are grateful to the following people who allowed us to examine specimens in their collections (those marked with an asterisk donated specimens to the San Diego Natural History Museum Marine Invertebrate collection): Judith Bertsch, L. J. Bibbey (*), Gene Everson, Robert and Dorothy Janowsky, Clifford and Clifton Martin (*), and Ben and Ruth Purdy (*). We are also grateful to Dr. William K. Emerson, American Museum of Natural History, Dr. Emily H. Vokes, Tulane University, and Dr. Reid Moran, San Diego Natural History Museum, for comments on various portions of this manuscript.

Literature Cited

Brazier, John. 1877. List of marine shells with descriptions of the new species collected during the "Chevert" expedition. Proceedings of the Linnean Society of New South Wales 1:169–181. (not seen)

Broderip, William John, and George Brettingham Sowerby. 1833. The characters of new species of Mollusca and Conchifera, collected by Mr. Cuming. Proceedings of the Zoological Society of London (1832) 2:173–179. (14 January 1833)

Clench, William J., and I. Perez Farfante. 1945. The genus *Murex* in the western Atlantic. Johnsonia 17:1–56; 28 plts. (29 May 1945)

Conrad, Timothy Abbott. 1846. Descriptions of new species of fossil and recent shells and corals. Proceedings of the Academy of Natural Sciences of Philadelphia 3(1):19–27; 1 plt.

Crosse, Joseph Charles Hippolyte. 1869. Diagnoses molluscorum novorum. Journal de Conchyliologie 17(4):408–410. (1 October 1869)

Dall, William Healey. 1908. The Mollusca and Brachiopoda. Bulletin of the Museum of Comparative Zoology, Harvard 43(6):205–487; 22 plts. (October 1908)

Emerson, William Keith, and Anthony D'Attilio. 1970. Three new species of muricacean gastropods from the eastern Pacific. The Veliger 12(3):270–274; plts. 39–40; 4 text figs. (1 January 1970)

Emerson, William Keith, and Anthony D'Attilio. 1979. Six new living species of muricacean gastropods. The Nautilus 93(1):1–10; 21 text figs. (10 January 1979)

Jousseaume, Felix Pierre. 1880. Division methodique de la famille des Purpurides. Le Naturaliste 2(42):335–336. (15 December 1880)

Kosuge, Sadao. 1979. Descriptions of two new species of the family Muricidae (Gastropoda, Mollusca). Bulletin of the Institute of Malacology Tokyo 1(1):1–2; 1 plt. (30 May 1979)

Locard, Arnould. 1897. Expedition scientifique de *Travailleur* et du *Talisman*. Paris, vol. 1, 515 pp.; 22 plts.

Löbbecke, Th., and Wilhelm Kobelt. 1879. Diagnosen neuer Murices. Jahrbuch der Deutschen Malakozoologischen Gesellschaft 6(1):78–79. (January 1879)

Melvill, James Cosmo, and Robert Standen. 1899. Report on the marine Mollusca obtained during the first expedition of Prof. A. C. Haddon to the Torres Straits in 1888–1889. Journal of the Linnean Society of London 27:150–206; plts. 1–2. (not seen)

Ponder, Winston F. 1972. Notes on some Australian genera and species of the family Muricidae (Neogastropoda). Journal of the Malacological Society of Australia 2(3):215–248; 23 plts.; 4 text figs. (24 March 1972)

Radwin, George Edward, and Anthony D'Attilio. 1971. Muricacean supraspecific taxonomy based on the shell and the radula. Abstracts and Proceedings of the Fourth Annual Meeting of the Western Society of Malacologists, The Echo 4:55–67; 23 text figs. (27 December 1971)

Radwin, George Edward, and Anthony D'Attilio. 1976. Murex shells of the world: an illustrated guide to the Muricidae. Stanford University Press, Stanford, California. 285 pp., 32 plts.; 192 text figs. (16 December 1976)

Rafinesque, Constantine Samuel. 1815. Analyse de la nature on tableau du univers et des corps organisés. Barravecebia, Palermo. (not seen)

Röding, Peter Friedrich. 1798. Museum Boltenianum sive catalogus comeliorum e tribus regnis naturae. J. C. Trappii, Hamburg. viii & 199 pp.

Shikama, Tokio. 1977. Descriptions of new and noteworthy Gastropoda from western Pacific and Indian Oceans. Science Reports of the Yokohama National University, Sec. II, No. 24:9–23; 5 plts.; 1 text fig. (November 1977)

Smith, Maxwell. 1938. Further notes upon Tertiary and Recent mollusks from Florida, with descriptions of new species. The Nautilus 51(3):88–91. (January 1938)

Sowerby, George Brettingham II. 1834. The conchological illustrations, parts 62 and 63; 2 plts. (30 June 1834)

Sowerby, George Brettingham II. 1841. The conchological illustrations, part 18 to 192; 6 plts. (Plates 187–190, 1 January 1841; plts. 191–192, February 1841)

Swainson, William. 1820–1833. The zoological illustrations. Baldwin, Cradock and Joy, London.

Swainson, William. 1822. A catalogue of the . . . shells which formed the collection of Mrs. Bligh, with an appendix containing . . . descriptions of many new species. London 58 pp.; plts. 1–2.

Department of Marine Invertebrates, San Diego Natural History Museum, Balboa Park, P.O. Box 1390, San Diego, California 92112 USA.